2

SOFTWARE REQUIREMENTS
SPECIFICATION
SRS 1-90
VOLUME V
1 DECEMBER 1990

*JOINT DATA SYSTEMS*
*SUPPORT CENTER*

# SOFTWARE REQUIREMENTS SPECIFICATION FOR THE MAPPING AND GRAPHIC INFORMATION CAPABILITY (MAGIC) VOLUME V - GRAPHIC EDITOR CSCI

APPROVED FOR
PUBLIC RELEASE
DISTRIBUTION UNLIMITED

## RECORD OF CHANGES

| Change Number | Dated | Date Entered | Signature of Person Making Change |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

JOINT DATA SYSTEMS SUPPORT CENTER

Software Requirements Specification SRS 1-90

1 December 1990

# SOFTWARE REQUIREMENTS SPECIFICATION
# FOR THE
# MAPPING AND GRAPHIC INFORMATION CAPABILITY (MAGIC)
# VOLUME V - GRAPHIC EDITOR CSCI

SUBMITTED BY:

Jeanne L. Muenzen

Jeanne L. Muenzen
Chief
Information Systems Branch

APPROVED BY:

Thomas R Epperson

Thomas R. Epperson
Deputy Director
NMCS ADP Directorate

Copies of this document may be obtained from the Defense Technical Information Center, Cameron Station, Alexandria, Virginia 22304-6145.

Approved for public release; distribution unlimited.

## ACKNOWLEDGMENT

This Software Requirements Specification was prepared under the general direction of the Chief, Information Systems Branch (JNGG); Chief, General Applications Division (JNG); and the Deputy Director, NMCS ADP Directorate (JN).

## CONTENTS

TABLES

## ABSTRACT

This Software Requirements Specification (SRS) specifies the engineering and qualification requirements for the Graphic Editor CSCI of the Mapping and Graphic Information Capability (MAGIC). Furthermore, this specification will be used as the basis for the design and formal testing of that CSCI.

The SRS is divided into three major sections. These sections cover Engineering Requirements (Section 3), Qualification Requirements (Section 4), and Preparation for Delivery (Section 5).

This specification supersedes the Rational-generated Interface Requirements Specification (configuration identifier 8734/89-IRS-GIPSY-003) for the Modernized Graphic Information Presentation System (GIPSY) that was delivered under Contract Number DCA100-89-C-0015 and dated 13 September 1989.

## SECTION 1. SCOPE

This section provides an introduction to the specification. The following paragraphs discuss the identification of the Computer Software Configuration Item (CSCI), provide an overview of the CSCI, and provide a document overview.

### 1.1 Identification

This Software Requirements Specification (SRS) establishes the engineering and qualification requirements for the Graphic Editor CSCI (CSCI-5).

### 1.2 CSCI Overview

The Graphic Editor CSCI provides an interactive capability to create new slides, enhance existing slides, and edit multiple slides simultaneously on the WWMCCS Workstation (WWS) through the use of freehand drawing functions, polygon manipulation, and other graphic editing techniques. The resultant slides may be viewed singly by the user in a MAGIC session or incorporated into a slide presentation with other slides.

### 1.3 Document Overview

This SRS specifies the requirements allocated to the Graphic Editor CSCI and enables the Government to assess whether or not the completed CSCI complies with those requirements. Upon Government approval and authentication, the SRS becomes the Allocated Baseline for the CSCI and is used by the contractor as the basis for development and formal testing of the CSCI.

As such, this SRS specifies the complete list of requirements (functional, interface, performance, qualification, etc.) for the Graphic Editor CSCI. It includes requirements for programming design, adaptation, quality factors, and traceability of the CSCI, as well as delivery preparation and ancillary notes, such as references and terms and abbreviations.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION 2. APPLICABLE DOCUMENTS

This section specifies the applicable reference documents that have been used during the preparation of this specification.

### 2.1 Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and this specification, this specification shall be considered a superseding requirement.

SPECIFICATIONS:

| | |
|---|---|
| DI-MCCR-80025A | Software Requirements Specifications Data Item Description (DID) |
| SDP 2-90 | Software Development Plan (SDP) for the Mapping and Graphic Information Capability System (MAGIC) |
| <reference> | Functional Description for the Mapping and Graphic Information Capability (MAGIC) |
| <reference> | Software Quality Program Plan for the Mapping and Graphic Information Capability System (MAGIC) |

STANDARDS:

| | |
|---|---|
| DOD-STD-2167A | Defense System Software Development |

DRAWINGS:

None

OTHER PUBLICATIONS:

| | |
|---|---|
| PM 1-90 | Documentation Standards and Publications Style Manual |
| TM 405-90 | Software Standards and Procedures Manual for the JNGG Graphics Program |

Copies of the specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the contracting agency or as directed by the contracting officer.

### 2.2 Non-Government Documents

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and this specification, this specification shall be considered a superseding requirement.

SPECIFICATIONS:

None

STANDARDS:

| | |
|---|---|
| ANSI X3.159-1989 | Programming Language C |

DRAWINGS:

None

OTHER PUBLICATIONS:

| | |
|---|---|
| 8-60-004A/B | MacDraw II Manual |
| 8-60-029A/B | New Features Guide |

Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal Agencies.

## SECTION 3. ENGINEERING REQUIREMENTS

This section specifies the engineering requirements necessary to ensure proper development of the Graphic Editor CSCI. All requirements included in this section are allocated from those defined in appendix A of the Functional Description (FD) referenced in the specifications of paragraph 2.1.

### 3.1 CSCI External Interface Requirements

The Graphic Editor CSCI interfaces with the Internal Processing CSCI and the C Library. The following subparagraphs provide a general description of each interface.

3.1.1 Graphic Editor to C Library (INT-5.001). This interface establishes the connection between the C Library and the Graphic Editor CSCI. This interface is used to perform standard input/output operations, access math library functions, use memory allocation operations, and to launch Commercial Off-The-Shelf (COTS) packages.

This interface satisfies the following functional requirements:

a. Compose drawings (E.1)

(1) Standard draw functions (E.1.a)

(a) Freehand drawing (E.1.a.1)

(b) Create a line (E.1.a.2)

(c) Create a rectangle (E.1.a.3)

(d) Create a circle (E.1.a.4)

(e) Create a polygon (E.1.a.5)

(f) Create an arc (E.1.a.6)

(g) Create an ellipse (E.1.a.7)

(h) Fill (E.1.a.8).

(2) Rubberband technique draw functions (E.1.b)

(a) Create a symbol (E.1.b.1)

(b) Zoom (E.1.b.2)

(c) Unzoom (E.1.b.3)

(d) Pan (E.1.b.4)

(e) Unpan (E.1.b.5)

(f) Erase (E.1.b.6)

(g) Change attributes (e.g., background color, foreground color, line width, line style, fill pattern, fill color) (E.1.b.7).

b. Manage text (E.2)

(1) Enter horizontal text (E.2.a)

(2) Enter vertical text (E.2.b)

(3) Enter centered text (E.2.c)

(4) Set tab (E.2.d)

(5) Clear tab (E.2.e)

(6) Rotate text (E.2.f)

(7) Cut text (E.2.g)

(8) Uncut text (E.2.h)

(9) Copy text (E.2.i)

(10) Paste text (E.2.j)

(11) Erase text (E.2.k)

(12) Un-erase text (E.2.1)

(13) Set margins (E.2.m)

(14) Overwrite text (E.2.n)

(15) Change current text attributes (e.g., text size, text style, text spacing, text color, background color) (E.2.o).

c. Manipulate an object (E.3)

(1) Cut an object/symbol (E.3.a)

(2) Uncut an object/symbol (E.3.b)

(3) Copy an object/symbol (E.3.c)

(4) Paste (E.3.d)

(5) Group an object into a symbol (E.3.e)

(6) Split an object from a symbol (E.3.f)

(7) Erase an object/symbol (E.3.g)

(8) Un-erase an object/symbol (E.3.h)

(9) Scale an object/symbol (E.3.i)

(10) Rotate an object/symbol (E.3.j)

(11) Modify object attributes (e.g., object color, line width, line style, fill pattern, fill color) (E.3.k).

d. Print functions (E.4)

(1) Add a slide to an output device queue (E.4.a)

(2) List an output device queue (E.4.b)

(3) Delete a slide from an output device queue (E.4.c)

(4) Reorder an output device queue (E.4.d)

(5) Cancel current print job (E.4.e).

3.1.2 Graphic Editor to Internal Processing (INT-5.002). This interface is used by the Graphic Editor CSCI to access low-level and system-wide utilities and services resident in the Internal Processing CSCI (e.g., path name manipulation, string manipulation, and Unix system toolbox routines).

This interface satisfies the following functional requirements:

a. Print functions (E.4)

b. Add a slide to an output device queue (E.4.a)

c. List an output device queue (E.4.b)

d. Delete a slide from an output device queue (E.4.c)

e. Reorder an output device queue (E.4.d)

f. Cancel current print job (E.4.e).

## 3.2 CSCI Capability Requirements

The following subparagraphs identify the capability requirements that the Graphic Editor CSCI shall satisfy. The CSCI operates only in the unassisted

Table 3-1. Mapping of States/Modes to Capabilities

| STATE | MODE | CAP-5.1 | CAP-5.2 | CAP-5.3 | CAP-5.4 |
|---|---|---|---|---|---|
| ASSISTED | LOCAL | | | | |
| | REMOTE | | | | |
| UNASSISTED | LOCAL | ● | ● | ● | ● |
| | REMOTE | | | | |

(7) Change attributes (e.g., background color, foreground color, line width, line style, fill pattern, fill color) (E.1.b.7).

3.2.2 Text Manager (CAP-5.2). This capability allows the user to enter and manipulate text on the workstation screen. Text can be created or modified only by this capability although text and graphics may appear in a mixed display.

This capability satisfies the following functional requirements:

a. Manage text (E.2)

b. Enter horizontal text (E.2.a)

c. Enter vertical text (E.2.b)

d. Enter centered text (E.2.c)

e. Set tab (E.2.d)

f. Clear tab (E.2.e)

g. Rotate text (E.2.f)

h. Cut text (E.2.g)

i. Uncut text (E.2.h)

j. Copy text (E.2.i)

k. Paste text (E.2.j)

l. Erase text (E.2.k)

m. Un-erase text (E.2.1)

n. Set margins (E.2.m)

o. Overwrite text (E.2.n)

p. Change current text attributes (e.g., text size, text style, text spacing, text color, background color) (E.2.o).

3.2.3 Object Manipulation (CAP-5.3). This capability allows the user to manipulate objects in a slide. An object is a single drawn picture item. A symbol is a grouping of one or more objects.

This capability satisfies the following functional requirements:

a. Manipulate an object (E.3)

b. Cut an object/symbol (E.3.a)

c. Uncut an object/symbol (E.3.b)

d. Copy an object/symbol (E.3.c)

e. Paste (E.3.d)

f. Group an object into a symbol (E.3.e)

g. Split an object from a symbol (E.3.f)

h. Erase an object/symbol (E.3.g)

i. Un-erase an object/symbol (E.3.h)

j. Scale an object/symbol (E.3.i)

k. Rotate an object/symbol (E.3.j)

l. Modify object attributes (e.g., object color, line width, line style, fill pattern, fill color) (E.3.k).

3.2.4 Print Functions (CAP-5.4). This capability provides functions for the user to output slides to supported hardcopy devices (e.g., printers or plotters).

This capability satisfies the following functional requirements:

a. Print functions (E.4)

b. Add a slide to an output device queue (E.4.a)

c. List an output device queue (E.4.b)

d. Delete a slide from an output device queue (E.4.c)

e. Reorder an output device queue (E.4.d)

f. Cancel current print job (E.4.e).

### 3.3 CSCI Internal Interfaces

No internal interfaces have been identified for this CSCI.

### 3.4 CSCI Data Element Requirements

No internal or external data elements have been identified for this CSCI.

### 3.5 Adaptation Requirements

The following subparagraphs specify the requirements for adapting this CSCI to site-unique conditions and to changes in the system environment.

3.5.1 Installation-Dependent Data. There are no specific installation-dependent data requirements needed for adapting this CSCI to site-unique conditions or to changes in the system environment.

3.5.2 Operational Parameters. There are no specific operational parameters needed for adapting this CSCI to site-unique conditions or to changes in the system environment.

### 3.6 Sizing and Timing Requirements

Sizing requirements pertinent to this CSCI are:

a. A minimum of 8 megabytes (Mb) of Random Access Memory (RAM) shall be required to execute MAGIC.

b. A minimum of 2 Mb of free disk space shall be required to execute MAGIC.

c. A minimum of 16 Mb of swap space shall be required to execute MAGIC.

Timing requirements pertinent to this CSCI are twofold:

a. MAGIC's response to a user's mouse click or a keystroke for a menu or dialog box shall be within a 5-second timeframe.

b. If the users-input choice requires MAGIC to interface with a COTS package (either launching or processing), system response shall be within a 5-second timeframe. In other words, the users must either receive some sort of acknowledgment that processing is going on or obtain the end result of their selection.

### 3.7 Safety Requirements

This CSCI is a software product and is intended for use in an office environment. As such, there are no applicable requirements regarding potential hazards to personnel, property, and the physical environment.

### 3.8 Security Requirements

MAGIC is released as an unclassified system and all system files released with it are unclassified. However, MAGIC's features may be used to analyze and present classified information from classified databases. Under these circumstances, MAGIC shall provide the facilities to properly label the screen images and the hardcopy reports, but it is and will remain the user's responsibility to safeguard any and all classified information. MAGIC cannot grant access to classified databases unless the user has permission and access to those files.

Security requirements for all hardware suites and configurations capable of executing MAGIC shall remain the same as required for other operational considerations pertinent and applicable to that equipment and environment. Furthermore, the safeguarding of privacy act information also remains the user's responsibility.

Additional requirements regarding integrity requirements are specified in subparagraph 3.10.4 of this specification.

## 3.9 Design Constraints

This CSCI will be developed in accordance with the standards identified in the Software Standards and Procedures Manual (SSPM). MAGIC has very few design constraints due to its utilization of ANSI C, X Windows, and Open Software Foundation (OSF)/Motif in functional processing:

a. Due to usage of the Oracle COTS package for database management processing, MAGIC is constrained to those data types and parameters supported by Oracle's SQL*Loader package.

b. Specific tables stored in the Oracle database (on the workstation) as well as specific data files resident on the WWMCCS host are accessible only to the MAGIC user who has created them (or to one who has been given permissions to them by the owner).

c. Usage of the host-based GIPSY system will introduce a number of limitations that do not apply to a MAGIC user utilizing workstation-based data. Specifically, not all of Oracle's capabilities supported by MAGIC in local mode can be supported by MAGIC's interface to GIPSY due to inherent differences between the two systems (Oracle and GIPSY). The user must be at least somewhat aware of GIPSY concepts and terminology which is different (e.g., File Descriptor Table (FDT) and Index File) and not all functionality can be supported (e.g., very limited Oracle GROUP functionality).

d. Usage of a modem for host access will have definitive impacts related to both how and how fast MAGIC can access the host, retrieve the data, and make it available to the MAGIC user on the workstation. Some software developed for the modem will be modem-specific and some will be inapplicable when MAGIC is transitioned to a direct host communications connection. The processing speed by which MAGIC users can receive response from the host and obtain their data is directly linked to modem speed (currently 2400 baud) and access availability (via Defender).

e. Target workstation hardware and operating system specifics are still changing at the time of writing this SRS. Since a prototype is being developed on a Sun Scalable Processor Architecture (SPARC)station and the target is presumed to be the Macintosh IIfx, the design is limited to those aspects common across the platforms wherever possible.

f. The utilization of the Wingz COTS package to perform nearly all business graphics-related processing introduces several design constraints. Currently, nearly all of the constraints noted below arise from the fact that MAGIC is being developed on the Sun SPARCstation and the Wingz version (Version 1.0) for the Sun platform was designed for execution in the SunView environment. Since MAGIC has been designed for the X Windows environment, a method was found that permits the execution of Wingz under the X11/NeWS server with the following design constraints:

(1) The "look and feel" of Wingz is not consistent with MAGIC's Motif-based "look and feel."

(2) The help text available with Wingz (in Version 1.0) cannot be modified.

(3) The menu bar title cannot be modified.

(4) The proper import of data into Wingz can be guaranteed only by using an assisted query.

(5) Curve graphs, Gantt charts, and histograms are not directly supported by Wingz

(6) Wingz requires a PostScript-capable printer or Hewlett-Packard Graphic Language (HPGL) plotter to print.

(7) The experimental interface to the X11/NeWS server may cause unpredictable results.

(8) The code generated to support both the X11/NeWS server execution method may not be portable to other environments.

## 3.10 Software Quality Factors

The following subparagraphs specify the software quality factors or "fitness for use" characteristics that are required for the Graphic Editor CSCI. They are divided into 11 categories: correctness, reliability, efficiency, integrity, usability, maintainability, testability, flexibility, portability, reusability, and interoperability.

3.10.1 Correctness Requirements. The requirements contained in this subparagraph specify the extent to which the CSCI is expected to satisfy its specifications and fulfill the user's mission objectives. The correctness requirements are:

a. The software shall be traceable. The functionality of the CSCI must possess a clear linkage from the requirements to the implementation with respect to the specific development and operational environment.

b. The software shall be consistent. The contractor is required to provide uniform design and implementation of techniques and notation.

c. The software shall be complete. The functionality of the CSCI must provide a full implementation of the functions required.

3.10.2 Reliability Requirements. The requirements contained in this subparagraph specify the extent to which the CSCI is expected to perform its intended functions with required precision. The reliability requirements are:

a. The error tolerance of the software shall be 2 percent. The CSCI is required to provide continuity of operation at least 98 percent of the time.

b. The software shall be consistent. The contractor is required to provide uniform design and implementation of techniques and notation.

c. The software shall be accurate. The software must provide the user's required precision in calculations and outputs within the limitations of the COTS package.

d. The software shall be simplistic. The functions of the CSCI must be implemented in a most understandable manner and avoid those coding/implementation practices that increase complexity.

3.10.3 Efficiency Requirements. The requirements contained in this subparagraph specify the amount of computing resources and code required by the CSCI to perform its functions. The efficiency requirements are:

a. The execution efficiency of the software shall be in accordance with the timing requirements of paragraph 3.6.

b. The storage efficiency of the software shall be in accordance with the sizing requirements of paragraph 3.6.

3.10.4 Integrity Requirements. The requirements contained in this subparagraph specify the extent to which access to the CSCI's software or data by unauthorized persons should be controlled. The integrity requirements are:

a. The CSCI shall be access controlled. However, due to the nature of MAGIC's design, access control functions are provided by the Human Interface CSCI (refer to Volume I of this SRS).

b. The software shall be access auditable. Some methodology must be provided for an audit of the access of both software and data.

3.10.5 Usability Requirements. The requirements contained in this subparagraph specify the effort required to learn, operate, prepare, input, and interpret the output of this CSCI. The usability requirements are:

a. Training for the use of this CSCI shall be provided as required through normal User Support activities which include functional demonstrations. Formal training is not required at this time due to the requirements for user-friendliness and usability satisfied by the Human Interface CSCI (refer to Volume I of this SRS).

b. The software shall be communicative and provide useful inputs and outputs which can be assimilated by the user. Although much of this requirement will be met by the functionality of the Human Interface CSCI (refer to Volume I of this SRS), the software of this CSCI must also be communicative wherever appropriate.

c. The software shall be operable. A smooth transition from current GIPSY operations as well as initial familiarizations with the Unix-based workstation must be provided wherever appropriate.

3.10.6 Maintainability Requirements. The requirements contained in this subparagraph specify the effort required to locate and fix an error in the operational software. The maintainability requirements are:

a. The software shall be consistent. The contractor is required to provide uniform design and implementation of techniques and notation.

b. The software shall be simplistic. The functions of the CSCI must be implemented in a most understandable manner and avoid those coding/implementation practices that increase complexity.

c. The software shall be concise. Functions must be implemented with a minimum amount of code.

d. The software shall be modular. The modularity of the CSCI shall be designed and implemented using four major attributes:

(a) Cohesiveness refers to the functional strength of a module, or how single-minded a module is. The modules shall strive for high cohesion (functional) wherever possible although mid-range cohesion is acceptable. The seven types of module cohesion are:

(1) Coincidental cohesion (WORST)

(2) Logical cohesion

(3) Temporal cohesion

(4) Procedural cohesion

(5) Communicational cohesion

(6) Informational cohesion

(7) Functional cohesion (BEST).

(b) Coupling refers to the interdependence of modules (i.e., how they communicate with each other). Of the six types of coupling, modules shall strive to employ data coupling wherever possible. The types of module coupling are:

(1) Content coupling (WORST)

(2) Common Coupling

(3) External Coupling

(4) Control Coupling

(5) Stamp Coupling

(6) Data Coupling (BEST).

(c) Complexity refers to the logical or control flow complexity of any given module. Modules shall be designed with low complexity since they will be easier to test and maintain:

(1) The cyclomatic complexity of a module shall be kept within 10 as determined by McCabe's Cyclomatic Complexity Metric.

(2) The size of any module shall be no more than 200 lines of executable code.

(d) Structure refers to whether or not a program is structured. Modules shall be designed in a structured manner to enhance maintainability as determined by the principles of essential complexity and program "knots":

(1) The essential complexity of a module shall be 1.

(2) Modules shall have 0 "knots." Knots are those places in a program where the control path crosses another.

e. The software shall be self-descriptive. The software must contain sufficient comments to provide explanation of the implementation of a function.

f. The software shall be traceable. The functionality of the CSCI must possess a clear linkage from the requirements to the implementation with respect to the specific development and operational environment.

3.10.7 <u>Testability Requirements</u>. The requirements contained in this subparagraph specify the effort required to test the CSCI to ensure that it performs its intended function. The testability requirements are:

a. The software shall be simplistic. The functions of the CSCI must be implemented in a most understandable manner and avoid those coding/implementation practices that increase complexity.

b. The software shall be modular. The CSCI must satisfy the requirements of modularity specified in subparagraph 3.10.6 above.

c. The software shall support instrumentation. All paths must be testable and all input parameters must be boundary testable (as defined in the SQPP).

d. The software shall be self-descriptive. The software must contain sufficient comments to provide explanation of the implementation of a function.

3.10.8 <u>Flexibility Requirements</u>. The requirements contained in this subparagraph specify the effort required to modify operational software. The flexibility requirements are:

a. The software shall be modular. The CSCI must satisfy the requirements of modularity specified in subparagraph 3.10.6 above.

b. The software shall be general. The software should not have input, processing, and output functions mixed in the same modules; all constants should be defined only once; and application and machine-dependent functions should not be mixed in the same modules.

c. The software shall be expandable. The CSCI must perform logical processing independent of data storage specifications (not commit all available memory capacity) and be extensible in terms of computational functions.

d. The software shall be self-descriptive. The software must contain sufficient comments to provide explanation of the implementation of a function.

3.10.9 <u>Portability Requirements</u>. The requirements contained in this subparagraph specify the effort required to transfer the CSCI from one hardware configuration and/or software system environment to another. The portability requirements are:

a. The software shall be modular. The CSCI must satisfy the requirements of modularity specified in subparagraph 3.10.6 above.

b. The software shall be self-descriptive. The software must contain sufficient comments to provide explanation of the implementation of a function.

c. The software shall be machine-independent. The ANSI C code used should be independent of word and character size and the data representation should also be machine-independent. Wherever possible, modules should be free of input/output references.

d. The software shall be as software system-independent as possible. The CSCI shall utilize only a common, standard subset of ANSI C and should limit dependence on software system utilities and software system library routines wherever possible. If at all possible, there should be no operating system references.

3.10.10 Reusability Requirements. The requirements contained in this subparagraph specify the extent to which the programs of the CSCI can be used in other applications (related to the packaging and scope of the functions that the programs perform). The reusability requirements are:

a. The software shall be general. The software should not have input, processing, and output functions mixed in the same modules; all constants should be defined only once; and application and machine-dependent functions should not be mixed in the same modules.

b. The software shall be modular. The CSCI must satisfy the requirements of modularity specified in subparagraph 3.10.6 above.

c. The software shall be as software system-independent as possible. The CSCI shall utilize only a common, standard subset of ANSI C and should limit dependence on software system utilities and software system library routines wherever possible. If at all possible, there should be no operating system references.

d. The software shall be machine-independent. The ANSI C code used should be independent of word and character size and the data representation should also be machine-independent. Wherever possible, modules should be free of input/output references.

e. The software shall be self-descriptive. The software must contain sufficient comments to provide explanation of the implementation of a function.

3.10.11 Interoperability Requirements. The requirements contained in this subparagraph specify the effort required to couple this MAGIC CSCI with another system. The interoperability requirements are:

a. The software shall be modular. The CSCI must satisfy the requirements of modularity specified in subparagraph 3.10.6 above.

b. The software shall utilize communications commonality wherever appropriate. It is recognized that this requirement will be satisfied primarily by the Internal Processing CSCI (refer to Volume VII of this SRS).

c. The software shall utilize data commonality. The CSCI should use a single module to perform any data translations and standard data representations should be used.

## 3.11 Human Performance/Human Engineering Requirements

Issues related to human performance and human engineering concerns have been noted and discussed previously in subparagraph 3.10.5 of this specification.

Operational issues are concerned with the hardware and software support environments required for the user. A brief summation of the user's operational needs would include the following:

a. Access to a Unix-based color graphics workstation that has the yet to be determined COTS package (e.g., MacDraw II) installed on it.

b. Access to auxiliary devices such as dot matrix printers, Postscript-capable laser printers, floppy disk drives (1.44 Mb), external tape backup units, and external mass storage devices.

Human error is a final issue related to human engineering requirements. Once the Graphic Editor has been initiated, errors will be captured by this CSCI's error handling facilities. Overall error handling will be provided via the Human Interface CSCI (Volume I of this SRS).

## 3.12 Requirements Traceability

A mapping of the engineering requirements in this specification to the functional requirements applicable to this CSCI in the FD is provided in table 3-2. A mapping of the allocation of the CSCI requirements from the FD to the engineering requirements in this specification is provided as table 3-3.

Table 3-2. Mapping of Applicable Requirements to the FD (Part 1 of 4)

| FUNCTIONAL REQUIREMENTS<br>ENGINEERING REQUIREMENTS | E.1 | E.1.a | E.1.a.1 | E.1.a.2 | E.1.a.3 | E.1.a.4 | E.1.a.5 | E.1.a.6 | E.1.a.7 | E.1.a.8 | E.1.b | E.1.b.1 | E.1.b.2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INT-5.001 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INT-5.002 | | | | | | | | | | | | | |
| CAP-5.1 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CAP-5.2 | | | | | | | | | | | | | |
| CAP-5.3 | | | | | | | | | | | | | |
| CAP-5.4 | | | | | | | | | | | | | |
| SIZING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TIMING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| DESIGN CONSTRAINTS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CORRECTNESS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| RELIABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| EFFICIENCY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEGRITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| USABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| MAINTAINABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TESTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FLEXIBILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PORTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| REUSABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEROPERABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

Table 3-2. Mapping of Applicable Requirements to the FD (Part 2 of 4)

| FUNCTIONAL REQUIREMENTS<br>ENGINEERING REQUIREMENTS | E.1.b.3 | E.1.b.4 | E.1.b.5 | E.1.b.6 | E.1.b.7 | E.2 | E.2.a | E.2.b | E.2.c | E.2.d | E.2.e | E.2.f | E.2.g |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INT-5.001 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INT-5.002 | | | | | | | | | | | | | |
| CAP-5.1 | ● | ● | ● | ● | ● | | | | | | | | |
| CAP-5.2 | | | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| CAP-5.3 | | | | | | | | | | | | | |
| CAP-5.4 | | | | | | | | | | | | | |
| SIZING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TIMING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| DESIGN CONSTRAINTS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CORRECTNESS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| RELIABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| EFFICIENCY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEGRITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| USABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| MAINTAINABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TESTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FLEXIBILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PORTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| REUSABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEROPER-ABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

Table 3-2. Mapping of Applicable Requirements to the FD (Part 3 of 4)

| FUNCTIONAL REQUIREMENTS / ENGINEERING REQUIREMENTS | E.2.h | E.2.i | E.2.j | E.2.k | E.2.l | E.2.m | E.2.n | E.2.o | E.3 | E.3.a | E.3.b | E.3.c | E.3.d |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INT-5.001 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INT-5.002 | | | | | | | | | | | | | |
| CAP-5.1 | | | | | | | | | | | | | |
| CAP-5.2 | ● | ● | ● | ● | ● | ● | ● | ● | | | | | |
| CAP-5.3 | | | | | | | | | ● | ● | ● | ● | ● |
| CAP-5.4 | | | | | | | | | | | | | |
| SIZING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TIMING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| DESIGN CONSTRAINTS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CORRECTNESS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| RELIABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| EFFICIENCY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEGRITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| USABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| MAINTAINABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TESTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FLEXIBILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PORTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| REUSABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEROPER-ABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

Table 3-2. Mapping of Applicable Requirements to the FD (Part 4 of 4)

| FUNCTIONAL REQUIREMENTS<br>ENGINEERING REQUIREMENTS | E.3.e | E.3.f | E.3.g | E.3.h | E.3.i | E.3.j | E.3.k | E.4 | E.4.a | E.4.b | E.4.c | E.4.d | E.4.e |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| INT-5.001 | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INT-5.002 | | | | | | | | ● | ● | ● | ● | ● | ● |
| CAP-5.1 | | | | | | | | | | | | | |
| CAP-5.2 | | | | | | | | | | | | | |
| CAP-5.3 | ● | ● | ● | ● | ● | ● | ● | | | | | | |
| CAP-5.4 | | | | | | | | ● | ● | ● | ● | ● | ● |
| SIZING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TIMING | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| DESIGN CONSTRAINTS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| CORRECTNESS | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| RELIABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| EFFICIENCY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEGRITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| USABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| MAINTAINABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| TESTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FLEXIBILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| PORTABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| REUSABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| INTEROPER-ABILITY | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● | ● |

Table 3-3. Allocation of Applicable FD Requirements to the SRS (Part 1 of 6)

| ENGINEERING REQUIREMENTS / FUNCTIONAL REQUIREMENTS | INT-5.001 | INT-5.002 | CAP-5.1 | CAP-5.2 | CAP-5.3 | CAP-5.4 | SIZING | TIMING | DESIGN CONSTRAINTS | CORRECTNESS | RELIABILITY | EFFICIENCY | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E.1 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.1 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.2 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.3 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.4 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.5 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.6 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.7 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.8 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.1 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.2 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.3 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.4 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.5 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.6 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.7 | ● |  | ● |  |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.2 | ● |  |  | ● |  |  | ● | ● | ● | ● | ● | ● | ● |
| E.2.a | ● |  |  | ● |  |  | ● | ● | ● | ● | ● | ● | ● |

Table 3-3. Allocation of Applicable FD Requirements to the SRS
(Part 2 of 6)

| ENGINEERING REQUIREMENTS / FUNCTIONAL REQUIREMENTS | INT-5.001 | INT-5.002 | CAP-5.1 | CAP-5.2 | CAP-5.3 | CAP-5.4 | SIZING | TIMING | DESIGN CONSTRAINTS | CORRECTNESS | RELIABILITY | EFFICIENCY | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E.2.b | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.c | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.d | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.e | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.f | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.g | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.h | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.i | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.j | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.k | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.l | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.m | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.n | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.2.o | ● | | | ● | | | ● | ● | ● | ● | ● | ● | ● |
| E.3 | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.a | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.b | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.c | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.d | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.e | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |

Table 3-3. Allocation of Applicable FD Requirements to the SRS
(Part 3 of 6)

| ENGINEERING REQUIREMENTS<br>FUNCTIONAL REQUIREMENTS | INT-5 001 | INT-5.002 | CAP-5.1 | CAP-5.2 | CAP-5.3 | CAP-5.4 | SIZING | TIMING | DESIGN CONSTRAINTS | CORRECTNESS | RELIABILITY | EFFICIENCY | INTEGRITY |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| E.3.f | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.g | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.h | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.i | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.j | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.3.k | ● | | | | ● | | ● | ● | ● | ● | ● | ● | ● |
| E.4 | ● | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| E.4.a | ● | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| E.4.b | ● | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| E.4.c | ● | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| E.4.d | ● | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● |
| E.4.e | ● | ● | | | | ● | ● | ● | ● | ● | ● | ● | ● |

Table 3-3. Allocation of Applicable FD Requirements to the SRS
(Part 4 of 6)

| ENGINEERING REQUIREMENTS<br>FUNCTIONAL REQUIREMENTS | USABILITY | MAINTAINABILITY | TESTABILITY | FLEXIBILITY | PORTABILITY | REUSABILITY | INTEROPER-ABILITY |
|---|---|---|---|---|---|---|---|
| E.1 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.1 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.2 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.3 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.4 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.5 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.6 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.7 | ● | ● | ● | ● | ● | ● | ● |
| E.1.a.8 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.1 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.2 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.3 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.4 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.5 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.6 | ● | ● | ● | ● | ● | ● | ● |
| E.1.b.7 | ● | ● | ● | ● | ● | ● | ● |
| E.2 | ● | ● | ● | ● | ● | ● | ● |
| E.2.a | ● | ● | ● | ● | ● | ● | ● |

Table 3-3. Allocation of Applicable FD Requirements to the SRS (Part 5 of 6)

| ENGINEERING REQUIREMENTS<br>FUNCTIONAL REQUIREMENTS | USABILITY | MAINTAINABILITY | TESTABILITY | FLEXIBILITY | PORTABILITY | REUSABILITY | INTEROPER-ABILITY |
|---|---|---|---|---|---|---|---|
| E.2.b | ● | ● | ● | ● | ● | ● | ● |
| E.2.c | ● | ● | ● | ● | ● | ● | ● |
| E.2.d | ● | ● | ● | ● | ● | ● | ● |
| E.2.e | ● | ● | ● | ● | ● | ● | ● |
| E.2.f | ● | ● | ● | ● | ● | ● | ● |
| E.2.g | ● | ● | ● | ● | ● | ● | ● |
| E.2.h | ● | ● | ● | ● | ● | ● | ● |
| E.2.i | ● | ● | ● | ● | ● | ● | ● |
| E.2.j | ● | ● | ● | ● | ● | ● | ● |
| E.2.k | ● | ● | ● | ● | ● | ● | ● |
| E.2.l | ● | ● | ● | ● | ● | ● | ● |
| E.2.m | ● | ● | ● | ● | ● | ● | ● |
| E.2.n | ● | ● | ● | ● | ● | ● | ● |
| E.2.o | ● | ● | ● | ● | ● | ● | ● |
| E.3 | ● | ● | ● | ● | ● | ● | ● |
| E.3.a | ● | ● | ● | ● | ● | ● | ● |
| E.3.b | ● | ● | ● | ● | ● | ● | ● |
| E.3.c | ● | ● | ● | ● | ● | ● | ● |
| E.3.d | ● | ● | ● | ● | ● | ● | ● |
| E.3.e | ● | ● | ● | ● | ● | ● | ● |

Table 3-3. Allocation of Applicable FD Requirements to the SRS
(Part 6 of 6)

| ENGINEERING REQUIREMENTS<br>FUNCTIONAL REQUIREMENTS | USABILITY | MAINTAINABILITY | TESTABILITY | FLEXIBILITY | PORTABILITY | REUSABILITY | INTEROPERABILITY |
|---|---|---|---|---|---|---|---|
| E.3.f | ● | ● | ● | ● | ● | ● | ● |
| E.3.g | ● | ● | ● | ● | ● | ● | ● |
| E.3.h | ● | ● | ● | ● | ● | ● | ● |
| E.3.i | ● | ● | ● | ● | ● | ● | ● |
| E.3.j | ● | ● | ● | ● | ● | ● | ● |
| E.3.k | ● | ● | ● | ● | ● | ● | ● |
| E.4 | ● | ● | ● | ● | ● | ● | ● |
| E.4.a | ● | ● | ● | ● | ● | ● | ● |
| E.4.b | ● | ● | ● | ● | ● | ● | ● |
| E.4.c | ● | ● | ● | ● | ● | ● | ● |
| E.4.d | ● | ● | ● | ● | ● | ● | ● |
| E.4.e | ● | ● | ● | ● | ● | ● | ● |

## SECTION 4. QUALIFICATION REQUIREMENTS

This section specifies the qualification methods to be used to ensure that the CSCI requirements of sections 3 and 5 have been satisfied.

### 4.1 Qualification Methods

This paragraph discusses the qualification methods to be used to ensure that all requirements of the Graphic Editor CSCI have been satisfied. The methods utilized shall satisfy the requirements described in the Software Quality Program Plan (SQPP) and in section 5 (Formal Qualification Testing) of the Software Development Plan (SDP). The specific methods to be utilized are as follows and a qualification cross-reference table appears as table 4-1:

a. Demonstration - the use of stubs and drivers to permit the functional operation of specific program unit(s) to ensure that the function to be performed is done so correctly.

b. Test - the execution of specific program unit(s) utilizing test data to ensure that the algorithmic logic performs correctly, in accordance with established test procedures.

c. Analysis - the verification and interpretation of the results obtained from the various methods described in this paragraph whereby the Quality Assurance (QA) Manager shall analyze the accumulated results to ensure that quality assurance standards are maintained.

d. Inspection - the visual review of source code and documentation to ensure that both coding standards and documentation guidelines are followed.

e. Reviews - the use of In-Process Reviews (IPRs), Initial Operational Capability (IOC), and Final Operational Capability (FOC) reviews to ensure that software development fulfills the defined requirements.

### 4.2 Special Qualification Requirements

No special qualification requirements are applicable for this CSCI.

Table 4-1. Qualification Cross-Reference Table

| REQUIREMENT | CM | SECTION 3 | QUALIFICATION | |
|---|---|---|---|---|
| NAME | IDENTIFIER | PARAGRAPH | METHODS* | LEVEL** |
| Draw Functions | CAP-5.1 | 3.2.1 | A,D,I,R,T | 1,2 |
| Text Manager | CAP-5.2 | 3.2.2 | A,D,I,R,T | 1,2 |
| Object Manipulation | CAP-5.3 | 3.2.3 | A,D,I,R,T | 1,2 |
| Print Functions | CAP-5.4 | 3.2.4 | A,D,I,R,T | 1,2 |

* Qualification Method

A - Analysis

D - Demonstration

I - Inspection

R - Reviews

T - Test

** Qualification Level

1 - Configuration Item

2 - System Integration

3 - System Installation

## SECTION 5. PREPARATION FOR DELIVERY

The Graphic Editor CSCI (CSCI-5) shall consist of all completed FOCs integrated into an operational system along with any corrected deficiencies. The preparation of the CSCI for delivery shall include, but not be limited to, the following (on a Sun workstation):

a. Recompile and relink all source code and create object and executable files

b. Provide necessary documentation to support the CSCI

c. Provide magnetic media (1.44 Mb disks or 1/4" tapes) copies of both source code and executable files in support of the CSCI

d. Provide a list of all known deficiencies

e. Provide a listing of all source programs involved in the preparation of the CSCI.

Documentation to be delivered with the CSCI includes the Software Development Folders (SDFs) for the CSCI and a Version Description Document (VDD). Furthermore, that portion of a Software Release Bulletin (SRB) appropriate to the CSCI shall also be produced and delivered.

The release media is UNCLASSIFIED and shall be accompanied by a delivery letter.

THIS PAGE INTENTIONALLY LEFT BLANK

## SECTION 6. NOTES

This section contains information of general interest that aids in understanding this specification. Specifically, document references to include both source and issue date are provided as well as a terms and abbreviations paragraph.

### 6.1 Document References

The following references were used in the preparation of this specification:

a. American National Standards Institute (ANSI), Programming Language C, ANSI X3.159-1989, New York, NY, 16 December 1989

b. Claris Corporation, MacDraw II Manual, Version 1.1, Document Number 8-60-004A/B, Mountain View, CA, 1988

c. Claris Corporation, New Features Guide, Document Number 8-60-029A/B, Mountain View, CA, 1988

d. Department of Defense (DOD), Defense System Software Development, Department of Defense Standard, DOD-STD-2167A, Washington, D.C., 29 February 1988

e. DOD, Software Requirements Specification, Data Item Description (DID), DI-MCCR-80025A, Washington, D.C., 29 February 1988

f. Joint Data Systems Support Center (JDSSC), Documentation Standards and Publications Style Manual, Procedures Manual (PM) 1-90, Washington, D.C., 1 August 1990

g. JDSSC, Functional Description for the Mapping and Graphic Information Capability (MAGIC) (Draft), <reference>, Washington, D.C., 15 March 1991

h. JDSSC, Software Development Plan (SDP) for the Mapping and Graphic Information Capability (MAGIC), SDP 2-90, Washington, D.C., 1 November 1990

i. JDSSC, Software Quality Program Plan for the Mapping and Graphic Information Capability (MAGIC) (Draft), <reference>, Washington, D.C., 23 July 1990

j. JDSSC, Software Standards and Procedures Manual for the JNGG Graphics Program, Technical Memorandum (TM) 405-90, Washington, D.C., 1 December 1990.

### 6.2 Terms and Abbreviations

The following terms, abbreviations, and acronyms specific to this document are listed below:

| | |
|---|---|
| ADP | Automated Data Processing |
| Allocated Baseline | The initially approved documentation describing an item's functional and interface characteristics that are allocated from those of a higher level CI; specified by MIL-STD-480B |
| ANSI | American National Standards Institute |
| ASCII | American Standard Code for Information Interchange |
| AT&T | American Telephone and Telegraph, Incorporated |
| C | The C programming language as specified by ANSI Standard X3.159-1989 |
| CAP | Configuration identifier prefix used to designate a capability |
| CI | Configuration Item |
| COTS | Commercial Off-The-Shelf |
| CSCI | Computer Software Configuration Item |
| Cyclomatic Complexity | A software metric that provides a quantitative measure of the logical complexity of a program |
| DCA | Defense Communications Agency |
| DI | Data Item |
| DID | Data Item Description |
| DIF | Data Interchange Format |
| DOD | Department of Defense |
| DOD-STD | Department of Defense Standard |
| DTIC | Defense Technical Information Center |
| FD | Functional Description as specified by DID # DI-IPSC-80689 of DOD-STD-7935A |
| FDT | GIPSY's File Descriptor Table |
| FOC | Final Operational Capability |
| GIPSY | Graphic Information Presentation System |
| GUI | Graphical User Interface |
| HPGL | Hewlett-Packard Graphic Language |
| H6000 | Honeywell 6080 mainframe computer standard at all WWMCCS sites |
| Index File | GIPSY's file used to enhance retrieval speeds against large, host-based ISP data files |
| INT | Configuration identifier prefix used to designate an external interface |
| IOC | Initial Operational Capability |
| IPR | In-Process Review |
| IPSC | Information Processing Standards for Computers |
| IRS | Interface Requirements Specification as specified by DID # DI-MCCR-80026A of DOD-STD-2167A |
| ISP | Indexed-Sequential Processor |
| JDSSC | Joint Data Systems Support Center |
| JN | NMCS ADP Directorate |
| JNG | General Applications Division |

| | |
|---|---|
| JNGG | Information Systems Branch; the OPR for MAGIC development |
| JTSA-P | Administrative Control Branch; Pentagon Technical Resource Center, Room MF612A |
| MAGIC | Mapping and Graphic Information Capability |
| Mb | Megabyte; 1,024,000 bytes of data |
| MCCR | Mission-Critical Computer Resources |
| MIL-STD | Military Standard |
| MIT | Massachusetts Institute of Technology |
| Module | In the MAGIC environment, a C language function |
| Motif | A user interface toolkit built on the X Window System and marketed by the Open Software Foundation |
| NMCS | National Military Command System |
| NTIS | National Technical Information Service; formerly the National Bureau of Standards |
| OPR | Office of Primary Responsibility |
| OSF | Open Software Foundation |
| PCS | GIPSY's Process Control Statement |
| PM | Procedures Manual |
| QA | Quality Assurance |
| QDF | GIPSY's Qualified Data File |
| QDT | GIPSY's Qualified Data Table |
| RAM | Random Access Memory |
| Rational | The R1000 Ada language-based development platform manufactured and sold by Rational Corporation |
| RDBMS | Relational Database Management System |
| RIN | Configuration identifier prefix used to designate an internal interface requirement |
| SDF | Software Development Folder |
| SDP | Software Development Plan as specified in DID # DI-MCCR-80030A of DOD-STD-2167A |
| SPARC | Scalable Processor Architecture marketed by Sun Microsystems, Incorporated |
| SQL | Structured Query Language as defined in ANSI X3.135-1986 |
| SQPP | Software Quality Program Plan as specified in DID # DI-QCIC-80572 of DOD-STD-2168 |
| SRB | Software Release Bulletin |
| SRS | Software Requirements Specification as specified by DID # DI-MCCR-80025A of DOD-STD-2167A |
| SSPM | Software Standards and Procedures Manual as specified by DID # DI-MCCR-80011 of DOD-STD-2167 |
| TM | Technical Memorandum as specified by JDSSC PM 1-90 |
| Unix | A multi-tasking operating system from AT&T that runs on a wide variety of computer systems from micro to mainframe |
| VDD | Version Description Document as specified by DID # DI-MCCR-80013A of DOD-STD-2167A |
| WWMCCS | Worldwide Military Command and Control System |
| X Windows | A device-independent and network-transparent windowing protocol for graphics workstations developed at MIT and copyrighted in 1984 |

THIS PAGE INTENTIONALLY LEFT BLANK